Date palm seeds

Click on the "Nutritional aspects" tab for recommendations for ruminants, pigs, poultry, rabbits, horses, fish and crustaceans


Common names

Date seeds, dates pits, date kernels, date stones, date pips

Species

Phoenix dactylifera L. [Arecaceae]

Feed categories

- Other plant by-products
- Plant products and by-products

Related feed(s)

- Date molasses
- Date palm leaves and date pedicels
- Date palm fruits

Description

Date seeds are the by-product of date stoning, either for the production of pitted dates or for the manufacture of date paste (Ecocrop, 2011; Barreveld, 1993). The date seed is a hard coated seed, usually oblong, ventrally grooved, with a small embryo. Date pits weigh 0.5 g to 4 g and represent 6 to 20% of the fruit weight depending on maturity, variety and grade (Ecocrop, 2011; Daghir, 2008; Zaid et al., 2002; Barreveld, 1993; Göhl, 1982).

Date seeds are traditionally used for animal feed. They can also be used as a source of oil (which has antioxidant properties valuable in cosmetics), as a coffee substitute, as a raw material for activated carbon or as an adsorbent for dye-containing waters (Lecheb, 2010; Banat et al., 2003; Barreveld, 1993). Date by-products are usually fed to animals during winter, though they can be used at any time of the year (Genin et al., 2004).

Distribution

Date by-products are available in countries of production (see **Distribution** in the Date palm fruits datasheet). Date seeds are available near to where dates are packed or processed. The date industry is the main source of date pits, but they are also produced at farm level in date paste production units (Barreveld, 1993).

Processes

Date pits have a hard seed coat that makes the seed components difficult to digest. It is necessary to process the seeds before feeding them to livestock.

Soaking

Traditionally, farmers soak date pits in water for 72 hours to increase their feeding value. However this method does not improve animal intake (Barreveld, 1993).

Grinding

Grinding increases nutrient availability by breaking and removing the seed coat. However, it is energy-consuming and causes wear and tear to the machinery (Barreveld, 1993). It is recommended to first crush the seed with a disk crusher and then grind them with a hammer-mill (Barreveld, 1993; Göhl, 1982).

Chemical treatments

Alkali treatments increase the digestibility of fibrous materials. Application of a 9.6% NaOH solution to ground date pits decreased NDF content and increased *in vitro* digestion rates. This treatment was more effective on finely ground date pits (4 mm *vs.* 8 mm) (Al-Yousef et al., 1986).

Biological treatments

Germinated date seeds (after 74 days) have a similar chemical composition to dry pits but are softer and can be more easily eaten by animals (Sumianah et al., 1984 cited by Barreveld, 1993).

Environmental impact

The by-products of date production have always been recycled by farmers and local populations, a practice that has been considered as "*an eloquent example of integrated sustainable use of renewable material resources*" (El-Mously, 2001). There

is a long tradition of using cull dates and date pits to feed animals, and the crop residues serve as raw materials to create household items, furniture and building materials (El-Mously, 2001).

Datasheet citation

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Date palm seeds

Nutritional attributes

Date seeds are a low protein feed, with about 5-11% DM crude protein. Oil content is in the 4-14% DM range. Date pits contain high and variable quantities of fibre, with a high level of lignification: crude fibre 16-51% DM, NDF 58-90% DM, ADF 41-46% DM and ADL 4-18% (Feedipedia, 2011; Boudechiche et al., 2009; Daghir, 2008; Lecheb, 2010; Barreveld, 1993; Genin et al., 2004). Varietal differences are significant (Boudechiche et al., 2009). Date pits contain appreciable amounts of K followed by P, Mg and Ca, but have a low Na content. Of the micro elements present, Fe, Mn, Zn and Cu are the most important (Barreveld, 1993).

Date seeds are tough and need to be processed before being fed to animals.

Potential constraints

Pesticide residues

Dates are fumigated to kill insects, often with methyl bromide (CH_3Br) (Glasner et al., 2002). The maximum residue level for methyl bromide on dried fruits was set at 2 mg/kg by the Codex Alimentarius (Codex Alimentarius, 2011). Other pesticides are used, including carbamates and organophosphates, that may leave residues (Khan et al., 2001).

In organic date palm production, carbon dioxide is used instead of methyl bromide (Glasner et al., 2002).

Steroid compounds

The presence of steroid compounds in date pits, notably estrone, progesterone and estriol, has been known since the 1950s, though the actual effects of these compounds on sheep growth and reproduction have yet to be clearly demonstrated (Barreveld, 1993; El-Gasim et al., 1995; El-Din et al., 2001). Treatments with hexane and diethyl ether (combined in some cases with germination) have been proposed in order to decrease the amount of steroids (El-Din et al., 2001).

Ruminants

The nutritive value of date seeds has been quite extensively studied due to their widespread availability in the countries where date production is important. It should be noted that most of the research concerning the utilization of date pits in ruminants is relatively old, not readily accessible and, therefore, difficult to assess. The renewed interest in these products is already resulting in new research work and this datasheet will be updated once enough contemporary literature becomes available.

Ground date seeds can be used up to 75% of the diet of ruminants provided that a good protein supplement (such as cottonseed cake) or urea is added. They are also useful to balance a diet that is too rich in protein, such as young pasture (Al-Wash et al., 1982). The crude protein and crude fat of date seeds are low but not negligible, and the seeds need to be processed so that the hard seed coat is no longer an obstacle to their digestion (See **Processes** above) (Barreveld, 1993).

Digestibility

The nutritive values of date seeds reported in the literature are variable, with *in vivo* DM digestibility in sheep ranging from 58% to 70% (El Shazly et al., 1963; Al-Yousef et al., 1993). Organic matter digestibility values higher than 80% have been reported (Richter et al., 1956; Al-Kinani et al., 1975 cited by Al-Wash et al., 1982). *In vitro* DM digestibility using the rumen fluids of goats, sheep and dromedaries were found to be much lower for dromedaries and sheep (30-35%) than for goats (52-60%) (Genin et al., 2004). Protein digestibility was generally low (less than 40%) or not measurable (Al-Yousef et al., 1993; Al-Wash et al., 1982; El Shazly et al., 1963). Date pits have a higher value than leaves and pedicels (Al-Yousef et al., 1993).

Cattle

In 2011, there was no recent research on the use of date pits in cattle feeding, even though such utilization is attested to in the literature for dairy and beef cattle (Al-Wash et al., 1982). The daily gain of calves was not affected when the percentage of date pits in the diet increased from 30 to 60% in a concentrate mixture of wheat bran, barley and sesame meal (Farhan et al., 1969 cited by Al-Wash et al., 1982).

Sheep

The optimal level of date pits in sheep diets is disputed, probably due to the large variety of experimental protocols used by researchers. In a fattening trial where lambs were given 0 to 75% date pits, the largest gain was obtained at the 75% level (with 25% alfalfa hay) (Al-Kinani et al., 1975 cited by Al-Wash et al., 1982). Another trial found that daily gain and carcass traits were improved when 50% crushed date pits were supplemented with urea and incorporated in a mixture containing alfalfa, a concentrate and molasses (Younis et al., 1981 cited by Al-Wash et al., 1982). An inclusion rate of 30% date pits gave the largest weight gain in sheep fed *Atriplex halimus* hay and a concentrate. The isonitrogenous replacement of barley grain by ground date pits, included at up 45% in the diet had no effect on total feed intake and *in vivo* DM digestibility despite a high increase in the NDF and ADF content of the diet. Fibre digestibility increased with the inclusion of date pits, which suggests that fibre digestibility of date pits was higher than that of barley grain. Feeding date pits may reduce the occurrence of acidosis more effectively than barley (Al-Owaimer et al., 2011).

Dromedaries

Raw date pits are an excellent slow release energy feed for camels during long desert journeys (Barreveld, 1993).

Pigs

Ground date seeds have been used for pigs up to 10% of the diet without depressing weight gains or feed efficiency (Göhl, 1982).

Poultry

The nutritional value of date seed meal is very low, due to the low protein content and the very high fibre content, resulting in metabolizable energy levels as low as 2.9 MJ/kg (Zaghari et al., 2009). It can be used in poultry feeds provided that this low energy content is taken into account in feed formulation and compensated by the addition of fat (Hussein et al., 1998).

Broilers

How actually valuable date pits are in broiler diets depends on the cost of energy and protein supplementation that their inclusion in the diet will require. Even when the addition of date seed meal leads to decreases in the cost of feed, this may be negatively offset by the loss of performance (Masoudi et al., 2010).

Maximum inclusion rates should be 5% in young animals and 10% in grower-finishers. Higher inclusion rates could be acceptable in slow-growing animals. The protein and energy balance of the diet should always be established carefully.

Broiler growth performance could be maintained with about 10% of date seeds in the diet (Afifi et al., 1966; Hussein et al., 1998; Hussein et al., 2003; Kamel et al., 1981) and a higher inclusion rate (27%) was acceptable for broiler performance (Vandepopuliere et al., 1995). However, other authors have noticed a decrease in performance at 10% date seed meal (Al-Bowait et al., 2006; Al-Bowait et al., 2007; Masoudi et al., 2010). These discrepancies could be due to differences in feed formulation. It also seems that young animals are less tolerant of date seeds than older animals (Zaghari et al., 2009).

Attempts at improving the feeding value of date pits for poultry have met limited success. Treatment with NaOH improved *in vitro* digestibility but actual broiler performance was lower than with the control diet (Al-Bowait et al., 2007). Treatment with sulfuric acid or cooking did not improve performance (Hussein et al., 1998; Hussein et al., 2003). Attempts to improve feed efficiency with enzyme cocktails were not successful (Hussein et al., 2003; Zaghari et al., 2009).

Layers

Little data is available on the use of date pits in layers. Inclusion at 10% of the diet resulted in improved performance compared to a control without date pits, but still yielded lower results than a commercial feed (Hermes et al., 2004). Up to 20% date seeds was tested without adverse effect on egg production and feed efficiency, but it decreased egg quality (Mahmoud, 2008).

Rabbits

The use of date pits in rabbits is disputed. In one study, ground date pits as a replacement for maize grain (up to 20% of the diet) to growing rabbits seriously depressed growth rate and feed efficiency. However, even at 5% inclusion rate, date pits reduced the growth rate by 28.5%, a reduction strong enough to cast a doubt on the sanitary quality of the date pits used in this study (Aboul-Ela et al., 1999). In another study, ground date pits replaced 50% of the maize in growing rabbit feeds, resulting in a significant improvement in feed efficiency. The addition of a commercial enzyme complex slightly improved the nutrient digestibility (Ibrahim et al., 2010).

Fish

Carp (Cyprinus carpio)

Date palm seeds could replace up to 75% of a wheat bran-barley mixture in young carp diets, improving growth rate. Total replacement significantly reduced growth rate and daily food consumption (Al-Asgah, 1988).

Nile tilapia (Oreochromis niloticus)

Date palm seeds can be fed to tilapia fingerlings but only after processing affecting their composition and structure (germination, fungi treatment). In Nile tilapia fingerlings fed isocaloric-isonitrogenous diets containing up to 45% date pits as a replacement for maize starch, final weight gain, feed conversion, specific growth rate and protein efficiency ratio were significantly reduced in fish fed diets with all levels of date pits compared to those fed the control diet. Diets containing 15% date pits sprouted for 15 days or for 30 days did not negatively affect growth and body composition (Belal et al., 2004). Tilapia fingerlings fed diets containing up to 30% fungi *Trichoderma reesei*-degraded date pits in replacement of maize grain had similar or better growth parameters than fish fed the control diet. However, higher rates affected performance (Belal, 2008).

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Tables of chemical composition and nutritional value

- Date palm (Phoenix dactylifera), pits

Avg: average or predicted value; SD: standard deviation; Min: minimum value; Max: maximum value; Nb: number of values (samples) used

Date palm (Phoenix dactylifera), pits

Main analysis	Unit	Avg	SD	Min	Max	Nb
Dry matter	% as fed	90.5	0.9	89.3	92.3	17
Crude protein	% DM	6.4	0.6	5.8	8.4	21
Crude fibre	% DM	28.9	10.1	15.7	47.9	19
NDF	% DM	66.1	4.5	57.5	69.4	6
ADF	% DM	45.5	3.9	41.2	52.8	6
Lignin	% DM	8.5	6.0	3.9	18.4	6
Ether extract	% DM	6.7	1.4	4.9	9.0	18
Ash	% DM	1.9	0.5	1.3	3.2	20
Gross energy	MJ/kg DM	20.0				*

Minerals	Unit	Avg	SD	Min	Max	Nb
Calcium	g/kg DM	3.5	2.0	0.6	6.7	14
Phosphorus	g/kg DM	2.3	0.6	1.3	3.3	14

Amino acids	Unit	Avg	SD	Min	Max	Nb
Alanine	% protein	4.2	0.1	4.1	4.4	4
Arginine	% protein	4.1	3.9	1.1	9.8	4
Aspartic acid	% protein	7.4	1.4	6.3	9.1	4
Cystine	% protein	1.7		1.7	1.8	2
Glutamic acid	% protein	13.3	3.5	9.6	17.2	4
Glycine	% protein	3.8	0.9	3.0	4.7	4
Histidine	% protein	1.5	0.6	0.9	2.1	4
Isoleucine	% protein	3.0	0.3	2.8	3.5	4
Leucine	% protein	5.7	0.1	5.6	5.8	4
Lysine	% protein	3.8	1.0	2.9	4.7	4
Methionine	% protein	1.6	0.1	1.5	1.6	4
Phenylalanine	% protein	3.5	0.1	3.4	3.6	4
Proline	% protein	3.0	0.3	2.7	3.3	4
Serine	% protein	3.8	0.3	3.5	4.0	4
Threonine	% protein	3.2	0.2	3.0	3.4	4
Tryptophan	% protein	0.8				1
Tyrosine	% protein	1.3	0.2	1.1	1.4	3
Valine	% protein	3.9	0.9	3.1	4.9	4

Ruminant nutritive values	Unit	Avg	SD	Min	Max	Nb
OM digestibility, Ruminant	%	71.4				1
Energy digestibility, ruminants	%	70.2				*
DE ruminants	MJ/kg DM	14.0				*
ME ruminants	MJ/kg DM	11.5				*
Nitrogen digestibility, ruminants	%	18.0		0.0	36.0	2

Pig nutritive values	Unit	Avg	SD	Min	Max	Nb
Energy digestibility, growing pig	%	44.8				*
DE growing pig	MJ/kg DM	8.9				*

Poultry nutritive values	Unit	Avg	SD	Min	Max	Nb
TME poultry	MJ/kg DM	3.3				1

The asterisk * indicates that the average value was obtained by an equation.

References

AFZ, 2011; Al-Yousef et al., 1993; El Shazly et al., 1963; El-Gasim et al., 1986; El-Hag et al., 1992; Fangauf et al., 1957; Genin et al., 2004; Hussein et al., 1998; Kamel et al., 1981; Kamel et al., 1981; Vandepopuliere et al., 1995

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English correction by Tim Smith (Animal Science consultant) and Hélène Thiollet (AFZ)

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